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Phytochemical screening of some anticancer designate medicinal plants of Polypetalae

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Abstract
Phytochemicals are the dependable sources for the treatment of different health problems. Anticancer medicinal plants possess cancer healing property due to their bioactive metabolites of secondary origin. The present work revels phytochemical screening of 23 anticancer medicinal plant species representing 17 families of Polypetalae for alkaloids, flavonoids, sterols, tannins, glycosides and saponins. Except *Phylanthusas amurus*, alkaloids were present in all plant species while flavonoids, sterols, resins, tannins, glycosides and saponins were present in 17, 12, 5, 13, 15 and 10 plant species, respectively. Results of the screening work on secondary metabolites were discussed in relation to their abundance and distribution in different test plants and their organs.

Keywords: Anticancer plant, phytochemical screening, Secondary metabolites, Polypetalae

Introduction
Medicinal plants are important for the indigenous systems of medicine. About 80% of the worlds' rural people rely on medicinal plants for health care because plant drugs are easily available and accessible to most people in the sense of price compared to modern allopathic drugs [1, 2]. More than 60% of anticancer drugs are of natural origin, or resulting from modifications of natural products and anticancer medicinal plants show cancer healing property due to some active secondary metabolites [3-5]. The discovery and development of vinblastine and vincristine alkaloids from the *Catharanthus roseus*, etoposide (VM 26) and teniposide (VP 16-213) from *Podophyllum* spp., irinotecan or camptothecin from *Camptotheca acuminate*, paclitaxel from *Taxus* spp. and several other natural compounds from different sources as efficacious anticancer agents provided convincing evidence that plants' secondary metabolites could be a potential source of anticancer agents and cancer chemo preventives [6-8]. Bangladesh is rich in herbal wealth and more than 1000 species of medicinal plants grow here [9], however, majority of them have not yet undergone thorough phytochemical screening for their bioactive secondary metabolites. About 500-752 medicinal plant species of Bangladesh have so far been enumerated and out of them, about 64 plants have been designated to possess anticancer activity [10, 11]. Considering the importance of natural products in cancer therapy, in the present work, 23 anticancer designate medicinal plant species of Polypetalae were subjected to phytochemical screening for their secondary metabolites.

Materials and Methods
Twenty three anticancer designate medicinal plant species of Bangladesh representing 17 families of Polypetalae, reported in published literature [10, 11], were considered in the present work for phytochemical screening for alkaloids, flavonoids, sterols, resins, tannins, glycosides and saponins. These plants were collected from the hilly campus of Chittagong University and its surroundings, identified and their voucher specimens (accession no. 2010-01-23) were kept in the department. For alkaloids, the modified method of Webb (1949) [12] was followed according to Amarasingham *et al.* [13] and Apline and Cannon [14]. Five alkaloid detecting reagents, e.g., Dragendorff (D), Wagner (W), Mayer (M), Hager (H) and Tannic acid (T), prepared following Cromwell [15], were used. Flavonoids were determined in the Et-OH extract following Wall *et al.* [16] and Farnsworth [17]. Sterols, tannins, glycosides and saponins were assessed following Bhattacharjee and Das [18], Wall *et al.* [16] and Eyjolfesson [19], respectively. The absence, presence and abundance of different secondary metabolites in the test samples were indicated by –, + and multiple of + signs, respectively. Each test was replicated thrice.

Results and Discussion
The classification of plants followed in present work was that of Engler, who divided Dicotyledon into 2 sub-classes, the Polypetalae and Sympetalae, and separate petals is a

characteristic of the Polypetalae. Out of 204 families of the Polypetalae, only 17 families represented by 23 species were considered in the present work. These families provide many critical resources for therapeutically important natural products like alkaloids, terpenoids, phenolics as well as some special nitrogen metabolite like non-protein amino acids, amines, cyanogenic glycosides, glucosinolates etc. and these natural products are the basis for many drugs of current use [20]. Results of the qualitative analysis of different secondary metabolites of 23 anticancer medicinal plants are given in Table 1 and 2. It is evident from the Table 1 that alkaloids were present in all plant species. Out of the total 115 tests done with five different alkaloid detecting reagents, 110 tests gave positive response in different degrees (+ to 4+) in the proportion: D-24, W-18, M-17, H-16 and T-23. On the basis of such differential score, the relative efficiencies of the reagents for alkaloid detection appeared as: D> T> W>M>H. Katavic [21] in a phytochemical survey examined 339 extracts of 77 species belonging to Elaeocarpaceae from different countries noted positive results for alkaloids in 35 extracts with Dragendorff's reagent. Pasha [22] reported positive response for alkaloids in 48 plant species out of 102 species of medicinal plants while Tariq *et al*. [23] noted 32 positive responses out of 42 they examined. Pascaline *et al*. [24], however, reported the presence of alkaloids and some other metabolites in all 10 plants species they examined. In the present work, 17 plant species gave strong (4+, 3+) and the rests gave weak (2+, +) positive responses for alkaloids. Kapoor *et al*. [25] noted weak positive response for alkaloids while others [22, 26] observed strong positive reactions in the range from 3+ to 4+ for alkaloids in a few plant species. Houghton *et al.* [27] noted positive response of *P. amura* for alkaloids. According to Viji and Murugesan [24] and Pascaline *et al.* [28], the leaf and stem and the leaf and root of medicinal plants, respectively contained a broad spectrum of secondary metabolites including alkaloids. Chhetri *et al*. [29] in a phytochemical screening for alkaloids and other bioactive chemicals, noted differences in the pattern of distribution of chemicals in different plant species and their parts.

Results presented in Table 2 show that out of the total 138 tests for 6 other plant constituents, there were 17, 12, 5, 13, 15 and 10 positive responses for flavonoids, sterols, resins, tannins, glycosides and saponins, respectively. Pasha [22] reported the presence of saponins in 14 plant species while Tariq *et al*. [23] noted the presence of flavonoids in 21, sterols in 22, tannins in 20 and saponins only in 4 species among the lot of 23 species of Asteraceae. In the present work, *C. asitica*, and *C. verum* gave maximum positive responses for these secondary metabolites. Ambi1 *et al.* [30] reported the presence of steroids, glycosides and flavonoids along with alkaloids in *Citrullus* seeds while Ayoola *et al*. [32] noted the presence of flavonoids, terpenoids, saponins, tannins and reducing sugars in *C. papaya*, *M. indica*, *P. guajava* and *V. amygdalina*, but cardiac glycosides and alkaloids in *M. indica* as well as alkaloids and anthraquinones in *P. guajava* and anthroquinones in *V. amygdalina* were absent. Sivasankari *et al.* [32] while examining the major metabolites like carbohydrates, tannins, saponins, flavonoids, alkaloids, betacyanins, quinones, terepenoids, phenols, glycosides and cardiac glycosides in *Caesalpinia pulcherrima* (a domesticated shrub) and *Caesalpinia bonduc* (a wild shrub) leaf extracts prepared with 4 different solvents reported their uneven distribution in the plant species and the wild plants contributed high values for the secondary metabolites than the domesticated. The presence of different secondary metabolites in medicinal plants justifies their wide range of therapeutic application as they show anti-oxidant, antiallergic, anti-inflammatory, antimicrobial, anticancer etc. activities [33-38]. Results of the present work suggest uneven and sporadic distribution and abundance of the secondary metabolites in different plant species. The contribution of plants to treat cancer is enormous and high number of new drugs is currently being evaluated in clinical trials. Vinca alkaloids, taxanes, combretastatins, podophylotoxins and camptothecins are some important examples of some natural products useful for cancer therapy.

Table 1: Alkaloid contents of 23 anticancer medicinal plants. Five alkaloid detecting reagents used were Dragendorff's (D), Wagner's (W), Mayer's (M), Hager's (H) and Tannic acid (T)

	Scientific name	Family	Plant/plant parts	Alkaloid detecting reagents used				
				D	W	M	H	T
1	*Aegle marmelos* Corr.	Rutaceae	Stem bark	2+	+	+	+	2+
2	*Amaranthus viridis* L.	Amaranthaceae	Leaf	2+	2+	2+	3+	2+
3	*Anacardium occidentale* L.	Anacardiaceae	Fruit	2+	+	+	+	2+
4	*Annona squamosa* L.	Annonaceae	Leaf	4+	2+	2+	2+	4+
5	*Azadirachta indica* A. Juss.	Meliaceae	Stem bark	+	+	+	+	+
6	*Barringtonia acutangula* (L.) Gaertn.	Barringtoniaceae	Stem bark	3+	+	+	+	2+
7	*Brassica oleracea* L.	Brassicaceae	Flower	3+	2+	2+	2+	3+
8	*Cajanus cajan* (L.) Huth	Papilionaceae	Pods	3+	2+	2+	2+	3+
9	*Cassia fistula* L.	Caesalpiniaceae	Pod	+	+	+	+	+
10	*Cassia obtusifolia* L.	Caesalpiniaceae	Leaf	+	+	+	+	+
11	*Cassia occidentalis* L.	Caesalpiniaceae	Leaf	2+	+	+	+	+
12	*Centella asiatica* (L.) Urban	Apiaceae	whole plant	2+	2+	2+	2+	2+
13	*Cicer arietinum* L.	Papilionaceae	Seeds	3+	3+	3+	3+	3+
14	*Cinnamomum verum* Presl.	Lauraceae	Stem bark	+	+	+	+	+
15	*Dipterocarpus turbinatus* Gaertn.	Dipterocarpaceae	Stem bark	+	+	+	+	+
16	*Euphorbia hirta* L.	Euphorbiaceae	Leaf	2+	+	+	3+	2+
17	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae	Leaf	2+	2+	2+	2+	2+
18	*Phylanthus amarus* Schum.	Euphorbiaceae	Leaf	-	-	-	-	-
19	*Phyllanthus embica* L.	Euphorbiaceae	Fruit	+	2+	+	+	+
20	*Piper betel* L.	Piperaceae	Leaf	4+	2+	2+	2+	4+
21	*Streblus asper* Lour.	Moraceae	Stem bark	2+	+	+	+	2+
22	*Tamarindus indica* L.	Caesalpiniaceae	Fruit pulp	3+	3+	3+	3+	3+
23	*Terminalia arjuna* (Roxb.) W. & A.	Combretaceae	Stem bark	3+	3+	3+	3+	3+

Table 2: Flavonoids, sterols, tannins, glycosides and saponins contents of 23 anticancer medicinal Plants.

Scientific name		Family	Plant/ plant parts	Six secondary metabolites					
				Flavonoids	Sterols	Resins	Tannins	Glycocides	Saponins
1	*Aegle marmelos* Corr.	Rutaceae	Stem bark	+	+	+	+	+	-
2	*Amaranthus viridis* L.	Amaranthaceae	Leaf	+	+	-	+	+	+
3	*Anacardium occidentale* L.	Anacardiaceae	Fruit	+	+	-	+	+	+
4	*Annona squamosa* L.	Annonaceae	Leaf	+	+	+	+	-	+
5	*Azadirachta indica* A. Juss.	Meliaceae	Stem bark	+	+	-	+	-	+
6	*Barringtonia acutangula* (L.) Gaertn.	Barringtoniaceae	Stem bark	+	+	+	+	-	+
7	*Brassica oleracea* L.	Brassicaceae	Flower	+	+	+	+	-	+
8	*Cajanus cajan* (L.) Huth	Papilionaceae	Pods	+	-	-	-	+	-
9	*Cassia fistula* L.	Caesalpiniaceae	Pod	+	-	-	-	+	-
10	*Cassia obtusifolia* L.	Caesalpiniaceae	Leaf	+	-	-	-	+	-
11	*Cassia occidentalis* L.	Caesalpiniaceae	Leaf	+	-	-	-	+	-
12	*Centella asiatica* (L.) Urban	Apiaceae	whole plant	+	+	+	+	+	+
13	*Cicer arietinum* L.	Papilionaceae	Seeds	-	+	-	-	+	-
14	*Cinnamomum verum* Presl.	Lauraceae	Stem bark	+	+	+	+	+	+
15	*Dipterocarpus turbinatus*	Dipterocarpaceae	Stem bark	+	-	-	-	-	-
16	*Euphorbia hirta* L.	Euphorbiaceae	Leaf	+	-	-	+	+	-
17	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae	Leaf	+	-	-	+	+	+
18	*Phylanthus amarus* Schum.	Euphorbiaceae	Leaf	+	+	-	+	-	+
19	*Phyllanthus embica* L.	Euphorbiaceae	Fruit	-	-	-	+	+	-
20	*Piper betel* L.	Piperaceae	Leaf	-	-	-	-	-	-
21	*Streblus asper* Lour.	Moraceae	Stem bark	-	+	-	-	-	-
22	*Tamarindus indica* L.	Caesalpiniaceae	Fruit pulp	-	-	-	-	+	-
23	*Terminalia arjuna* (Roxb.) W. & A.	Combretaceae	Stem bark	-	-	-	-	+	-

References

1. Sarker S. Medicinal plants and the law. Centre for Environmental law, WWF, India, 1996.
2. WHO. Traditional Medicines Strategy. WHO 2002-2005, World Health Organization, Geneva. Switzerland, 2002.
3. Syrovets T, Laumonnier Y. Project 1: Pentacyclic triterpenoids from the family of boswellic acids as antitumor agents: identification of effective molecular structures and molecular characterization of cytotoxic mechanisms, 2009. http:// www.uni-ulm.de/ klinik/ nhk/dept /research/projekte _Syrovets _neu.htm.
4. Kainsa S, Kumar P, Rani P. Medicinal Plants of Asian Origin Having Anticancer Potential: Short Review Asian Jof Biomed Pharma Scis. 2012; 2(10):01-07.
5. Korkina L, Kostyuk V. Biotechnologically produced secondary plant metabolites for cancer treatment and prevention. Current Pharmaceutical Biotech. 2012; 13(1):265-275.
6. Cragg GM, Simon JE, Jato JG, Snader KM. Drug discovery and development at the National Cancer Institute: Potential for New Pharmaceutical Crops. In: Janick J (ed) Progress in New Crops, ASHS Press, Arlington, VA. 1996, 554-560.
7. Kinghorn AD. Plant secondary metabolites as potential anticancer agents and cancer chemopreventives. Molecules, 2000; 5:285-288.
8. Malika S, Cusido RM, Mirjalili MH, Moyano E, Palazon J, Bonfill M. Production of the anticancer drug taxol in Taxus baccata suspension cultures: A review. Process Biochemistry. 2011; 46:23-34.
9. Mia AW, Ghani A. IN: Ghani, A. (ed), Traditional Medicine, Jahangirnagar University, 1990, 10-12.
10. Ghani A. Medicinal plants of Bangladesh with chemical constituents and uses. Asiatic Society of Bangladesh, Dhaka. 2003, 196-197.
11. Yusuf M, Chowdhury JU, Hoque MN, Begum J. Medicinal plants of Bangladesh. BCSRI, Chittagong, Bangladesh. 2009, 762.
12. Webb LJ. An Australian phytochemical survey.l. Alkaloids and cyanogenic compounds in the Queensland plants. C.S.I.R.D. Bull. 260, Melborne, 1949.
13. Amarasingham RD, Bisset NG, Millard AH, Woods MC. A phytochemical survey of Malaya plants: lll. Alkaloids and saponins. Eco. Bot. 1965; 18:290-295.
14. Apline THE, Cannon JR. Distribution of alkaloids in some western Australian plants. Eco. Bot. 1971; 25(4):366-380.
15. Cromwell BT. Modern method of plant analysis. Springer-veriag, Berlin, 1955, 373-374.
16. Wall ME, Krider MM, Krewson CF, Eddy CR, Willaman JJ, Corell SS *et al*. Steroidal sapogenins. Survey of plants for steroidal sapogenins and other constituents. J. Pharm. 1954, 1-7.
17. Farnsworth NR. Biological and physiochemical screening of plants. J. Pharm. 1966; 55:225-276.
18. Bhattacharjee AK, Das AK. Phytochemical survey of few Mysore plants. Econ. Bot. 1969; 23(3):204-206.
19. Eyjolfesson R. Recent advances in the chemistry of cyanogenic glycosides. Frog. Org. Nat. Pro. 1970; 27:75-108.

20. Rogerio AP, Sá-Nunes A, Faccioli LH. The activity of medicinal plants and secondary metabolites on eosinophilic inflammation. Pharmacol Res. 2010; 62(4):298-307.
21. Katavic Peter L. Chemical investigations of the alkaloids from the plants of the Family Elaeocarpaceae. A thesis submitted in fulfillment of the requirements of the degree of Doctor of Philosophy. School of Science/Natural Product Discovery (NPD) Faculty of Science, Griffith University. 2005, 3.
22. Pasha MK. *Phytochemical survey of Bangladesh Plants,* I. A. Priliminary report. Bangladesh. Journal Bot. 1977; 6(1-2):57-64.
23. Tariq M, Mossa JS, Al-Yahya MA, Al-Meshal IA, Al-Badar AA. Phytochemical and biological screening of Saudi medicinal plants. Int. J. Crude Drug Res. 1987; 25(1):17-25.
24. Viji M, Murugesan S. Phytochemical analysis and antibacterial activity of medicinal plant Cardiospermum halicacabum Linn. J Phytol. 2010; 2(1):68-77.
25. Pascaline J, Charles M, Lukhoba C, George O. Phytochemical constituents of some medicinal plants used by the Nandis of South Nandi district, Kenya. Journal of Animal & Plant Sciences. 2011; **9**(3):1201-1210.
26. Kapoor LD, Singh A, Kapoor SL, Srivastava SN. Suvery of Indian Plants For Saponin, alkaloids and flavpnoids. Lioydia. 1969; 32(3):397-303.
27. Affandi H, Nuryadin A, Prayogo SB. Medicinal herbs of Pasir Mayang, Jambi: Ethnopharmacy and toxicity screening. Biotropia. 2004; 22:40-58.
28. Houghton PJ, Woldemariama TZ, Siobhan OS, Thyagarajan SP. Two securinega type alkaloids from Phyllanthus amarus. Phytochemistry 1996; 43:715–717.
29. Chhetri HP, Yogol NS, Sherchan J, Anupa KC, Mansoor S, Thapa P. Phytochemical and antimicrobial evaluations of some medicinal plants of Nepal. Kathmandu Univ. J. Sci. Eng. & Technol. 2008; I(V):49-54.
30. Ambi1 AA, Abdurrahman1 EM, Sule MI, Pateh2 UU, Abdurrahman2 YR, Ibrahim3 NDG. Phytochemical screening and histopathological studies of Colosynthis citrullus in albinprats. Nig. Journ. Pharm. Sci. 2007; 6(2):7-13.
31. Ayoola GA, Coker HAB, Adesegun2 SA, Adepoju-bello AA, Obaweya K, Ezennia EC *et al*. Phytochemical Screening and Antioxidant Activities of Some Selected Medicinal Plants Used for Malaria Therapy in Southwestern Nigeria. Tropical J. Pharmaceutical Research. 2008; 7(3):1019-1024
32. Sivasankari K, Janaky S, Sekar T. Evaluation of phytochemicals in selected medicinal plants of the *Caesalpinia species*. Indian J. Sci. Technol. 2010; 3(12):1118-1121
33. Tanrisever N, Fischer H, Williamson GB. Methofurans from Calamintha ashei: Effects on *Schizachyrium scoparium* and *Lactuca sativa*, Phytochemistry 1988; 27(8):2523-2526.
34. Tashiro T, Sano S, Mori K. Synthesis of Optically Active 3-methyl-Alphahimachelene, sex pheromone of Sandfly, *Lutzomyia longipalpis* Nippon Kaggakai Koen Yokoshu. 2000; 78(2):900-908.
35. Raju J, Patlolla J, Swamy M, Rao C. Diosgenin, a steroid of *Trigonella foenum graecum* (Fenugreek), inhibits azoxymethaneinducedaberrant crypt foci formation in F344 rats and induces apoptosis in HT-29 human colon cancer cells. Cancer Epidemiol Biomarkers Prev. 2004; 13:1392-1398.
36. Oloyode OI. Chemical profile of unripe pulp of *Carica papaya*. Pakistan Journal of Nutrition, 2005; 4(6):379-381.
37. Ramzi AA, Mothana SA, Faisal AS, Lindquist A. Antimicrobial, Antioxidant and cytotoxic activities and phytochemical screening of some Yemeni Medicinal plants. Evidence–based Complementary and Alternative Medicine. 2008; 7(3):323-330.
38. Kunle OF, Egharevba HO. Preliminary studies on *Vernonia ambigua*: phytochemistry and antimicrobial screening of whole plant. Ethnobotanical Leaflets. 2009; 13:1216-1221